

CLAIMS

1. A cleaning and whitening system for teeth comprising a toothbrush having a cleaning surface, the toothbrush being adapted to direct polychromatic electromagnetic radiation toward the cleaning surface, wherein the polychromatic electromagnetic radiation consists essentially of wavelengths within a range of 300 to 750 nanometers.
2. The system of claim 1, further comprising a dentifrice comprising a photosensitive agent, wherein:
  - a. the photosensitive agent is dispersed throughout the dentifrice;
  - b. the dentifrice is dispersed in a varying thickness over a target surface during use of the system; and
  - c. the dentifrice transmits the polychromatic electromagnetic radiation, whereby a significant portion of the dispersed photosensitive agent in the varying thickness over the target surface receives the polychromatic electromagnetic radiation during use of the system, thus enabling the significant portion of the dispersed photosensitive agent to react.
3. The system of claim 2, wherein the photosensitive agent comprises a peroxy compound.
4. The system of claim 3, wherein the peroxy compound is hydrogen peroxide or carbamide peroxide.
5. The system of claim 2, wherein the photosensitive agent comprises one or more salt compounds.
6. The system of claim 5, wherein the dentifrice is aqueous and at least a portion of the salt compound is dissolved in the dentifrice.

7. The system of claim 2, wherein the dentifrice comprises a clear gel.
8. The system of claim 7, wherein the clear gel comprises clear abrasive particles.
9. The system of claim 7, wherein the clear gel comprises abrasive particles that are not clear.
10. The system of claim 2, wherein the photosensitive agent comprises an anti-bacterial agent for removing bacteria in the presence of the polychromatic electromagnetic radiation.
11. The system of claim 10, wherein the anti-bacterial agent has an affinity for bacteria, whereby, during use of the system, the anti-bacterial agent is concentrated about areas of bacteria on the target surface relative to other areas on the target surface.
12. The system of claim 2, wherein the photosensitive agent comprises an anti-plaque agent for removing plaque in the presence of the polychromatic electromagnetic radiation.
13. The system of claim 12, wherein the anti-plaque agent has an affinity for plaque, whereby, during use of the system, the anti-plaque agent is concentrated about areas of plaque on the target surface relative to other areas on the target surface.
14. The system of claim 2, further comprising a disclosing agent having an affinity for bacteria and/or plaque, wherein said disclosing agent changes appearance when irradiated by the polychromatic electromagnetic radiation, whereby, during use of the system, the disclosing agent is concentrated about areas of bacteria and/or plaque on the target surface relative to other areas on the target surface, whereby the

irradiated, disclosing agent visually announces locations of bacteria and/or plaque on the target surface.

15. The system of claim 2, wherein the photosensitive agent comprises a foaming agent for generating foam in the presence of the polychromatic electromagnetic radiation, whereby foam generated during use of the system operates as a carrier that delivers dentifrice to areas not reachable by the toothbrush cleaning surface.

16. The system of claim 2, wherein:

- a. the dentifrice is disposed in a container; and
- b. the toothbrush and the container are disposed within a package.

17. The system of claim 2, wherein the polychromatic electromagnetic radiation is substantially free of ultraviolet radiation.

18. The system of claim 2, wherein the cleaning surface comprises bristles.

19. A cleaning and whitening system for teeth comprising:

- a. a toothbrush having a cleaning surface, wherein the toothbrush is adapted to direct electromagnetic radiation toward the cleaning surface, wherein the electromagnetic radiation is at least substantially free of ultraviolet radiation; and
- b. a dentifrice comprising a photosensitive agent, wherein:
  - i. the photosensitive agent is dispersed throughout the dentifrice;
  - ii. the dentifrice is dispersed in a varying thickness over a target surface during use of the system; and
  - iii. the dentifrice transmits the electromagnetic radiation, whereby a significant portion of the dispersed photosensitive agent in

the varying thickness over the target surface receives the electromagnetic radiation during use of the system, thus enabling the significant portion of the dispersed photosensitive agent to react.

20. The system of claim 19, wherein the photosensitive agent comprises a peroxy compound.

21. The system of claim 20, wherein the peroxy compound is hydrogen peroxide or carbamide peroxide.

22. The system of claim 19, wherein the photosensitive agent comprises one or more salt compounds.

23. The system of claim 22, wherein the dentifrice is aqueous and at least a portion of the salt compound is dissolved in the dentifrice.

24. The system of claim 19, wherein the dentifrice comprises a clear gel.

25. The system of claim 24, wherein the clear gel comprises clear abrasive particles.

26. The system of claim 24, wherein the clear gel comprises abrasive particles that are not clear.

27. The system of claim 19, wherein the photosensitive agent comprises an anti-bacterial agent for removing bacteria in the presence of the electromagnetic radiation.

28. The system of claim 27, wherein the anti-bacterial agent has an affinity for bacteria, whereby, during use of the system, the anti-bacterial agent is concentrated about areas of bacteria on the target surface relative to other areas on the target surface.

29. The system of claim 19, wherein the photosensitive agent comprises an anti-plaque agent for removing plaque in the presence of the electromagnetic radiation.

30. The system of claim 29, wherein the anti-plaque agent has an affinity for plaque, whereby, during use of the system, the anti-plaque agent is concentrated about areas of plaque on the target surface relative to other areas on the target surface.

31. The system of claim 19, further comprising a disclosing agent having an affinity for bacteria and/or plaque, wherein said disclosing agent changes appearance when irradiated by the electromagnetic radiation, whereby, during use of the system, the disclosing agent is concentrated about areas of bacteria and/or plaque on the target surface relative to other areas on the target surface, whereby the irradiated, disclosing agent announces locations of bacteria and/or plaque on the target surface.

32. The system of claim 19, wherein the photosensitive agent comprises a foaming agent for generating foam in the presence of the electromagnetic radiation, whereby foam generated during use of the system operates as a carrier that delivers dentifrice to areas not reachable by the toothbrush cleaning surface.

33. The system of claim 19, wherein:
- a. the dentifrice is disposed in a container; and
  - b. the toothbrush and the container are disposed within a package.

34. The system of claim 19, wherein the electromagnetic radiation is substantially free of ultraviolet radiation.

35. The system of claim 19, wherein the cleaning surface comprises bristles.
36. The system of claim 19, wherein:
- a. the electromagnetic radiation is monochromatic; and
  - b. the photosensitive agent reacts when exposed to the monochromatic electromagnetic radiation.
37. The system of claim 36, wherein the photosensitive agent comprises a peroxy compound.
38. The system of claim 37, wherein the peroxy compound is hydrogen peroxide or carbamide peroxide.
39. The system of claim 36, wherein the photosensitive agent comprises one or more salt compounds.
40. The system of claim 39, wherein the dentifrice is aqueous and at least a portion of the salt compound is dissolved in the dentifrice.
41. The system of claim 36, wherein the dentifrice comprises a clear gel.
42. The system of claim 41, wherein the clear gel comprises clear abrasive particles.
43. The system of claim 41, wherein the clear gel comprises abrasive particles that are not clear.

44. The system of claim 36, wherein the photosensitive agent comprises an anti-bacterial agent for removing bacteria in the presence of the monochromatic electromagnetic radiation.

45. The system of claim 44, wherein the anti-bacterial agent has an affinity for bacteria, whereby, during use of the system, the anti-bacterial agent is concentrated about areas of bacteria on the target surface relative to other areas on the target surface.

46. The system of claim 36, wherein the photosensitive agent comprises an anti-plaque agent for removing plaque in the presence of the monochromatic electromagnetic radiation.

47. The system of claim 46, wherein the anti-plaque agent has an affinity for plaque, whereby, during use of the system, the anti-plaque agent is concentrated about areas of plaque on the target surface relative to other areas on the target surface.

48. The system of claim 36, further comprising a disclosing agent having an affinity for bacteria and/or plaque, wherein said disclosing agent changes appearance when irradiated by the monochromatic electromagnetic radiation, whereby, during use of the system, the disclosing agent is concentrated about areas of bacteria and/or plaque on the target surface relative to other areas on the target surface, whereby the irradiated, disclosing agent announces locations of bacteria and/or plaque on the target surface.

49. The system of claim 36, wherein the photosensitive agent comprises a foaming agent for generating foam in the presence of the monochromatic electromagnetic radiation, whereby foam generated during use of the system operates as a carrier that delivers dentifrice to areas not reachable by the toothbrush cleaning surface.

50. The system of claim 36, wherein:
- a. the dentifrice is disposed in a container; and
  - b. the toothbrush and the container are disposed within a package.
51. The system of claim 36, wherein the monochromatic electromagnetic radiation is substantially free of ultraviolet radiation.
52. The system of claim 36, wherein the cleaning surface comprises bristles.
53. The system of claim 19, wherein:
- a. the electromagnetic radiation is polychromatic; and
  - b. the photosensitive agent reacts when exposed to the polychromatic electromagnetic radiation.
54. The system of claim 53, wherein the photosensitive agent comprises a peroxy compound.
55. The system of claim 54, wherein the peroxy compound is hydrogen peroxide or carbamide peroxide.
56. The system of claim 53, wherein the photosensitive agent comprises one or more salt compounds.
57. The system of claim 56 wherein the dentifrice is aqueous and at least a portion of the salt compound is dissolved in the dentifrice.
58. The system of claim 53, wherein the dentifrice comprises a clear gel.



59. The system of claim 58, wherein the clear gel comprises clear abrasive particles.

60. The system of claim 58, wherein the clear gel comprises abrasive particles that are not clear.

61. The system of claim 53, wherein the photosensitive agent comprises an anti-bacterial agent for removing bacteria in the presence of the polychromatic electromagnetic radiation.

62. The system of claim 61, wherein the anti-bacterial agent has an affinity for bacteria, whereby, during use of the system, the anti-bacterial agent is concentrated about areas of bacteria on the target surface relative to other areas on the target surface.

63. The system of claim 53, wherein the photosensitive agent comprises an anti-plaque agent for removing plaque in the presence of the polychromatic electromagnetic radiation.

64. The system of claim 63, wherein the anti-plaque agent has an affinity for plaque, whereby, during use of the system, the anti-plaque agent is concentrated about areas of plaque on the target surface relative to other areas on the target surface.

65. The system of claim 53, further comprising a disclosing agent having an affinity for bacteria and/or plaque, wherein said disclosing agent changes appearance when irradiated by the polychromatic electromagnetic radiation, whereby, during use of the system, the disclosing agent is concentrated about areas of bacteria and/or plaque on the target surface relative to other areas on the target surface, whereby the irradiated, disclosing agent announces locations of bacteria and/or plaque on the target surface.

66. The system of claim 53, wherein the photosensitive agent comprises a foaming agent for generating foam in the presence of the polychromatic electromagnetic radiation, whereby foam generated during use of the system operates as a carrier that delivers dentifrice to areas not reachable by the toothbrush cleaning surface.

67. The system of claim 53, wherein:

- a. the dentifrice is disposed in a container; and
- b. the toothbrush and the container are disposed within a package.

68. The system of claim 53, wherein the polychromatic electromagnetic radiation is substantially free of ultraviolet radiation.

69. The system of claim 53, wherein the cleaning surface comprises bristles.

70. A teeth cleaning and whitening system comprising:

- a. a dentifrice comprising a photosensitive agent that reacts substantially only to electromagnetic radiation within a predetermined range wherein:
  - i. the photosensitive agent is dispersed throughout the dentifrice;
  - ii. the dentifrice is dispersed in a varying thickness over a target surface during use of the system; and
  - iii. the dentifrice transmits the electromagnetic radiation, whereby a significant portion of the dispersed photosensitive agent in the varying thickness over the target surface receives the electromagnetic radiation during use of the system, thus enabling the significant portion of the dispersed photosensitive agent to react; and

b. a toothbrush having a cleaning surface, the toothbrush being adapted to direct polychromatic electromagnetic radiation toward the cleaning surface, wherein the polychromatic electromagnetic radiation is bound to wavelengths that are substantially within the predetermined range.

71. The system of claim 70, wherein the photosensitive agent comprises a peroxy compound.

72. The system of claim 71, wherein the peroxy compound is hydrogen peroxide or carbamide peroxide.

73. The system of claim 70, wherein the photosensitive agent comprises one or more salt compounds.

74. The system of claim 73, wherein the dentifrice is aqueous and at least a portion of the salt compound is dissolved in the dentifrice.

75. The system of claim 70, wherein the dentifrice comprises a clear gel.

76. The system of claim 75, wherein the clear gel comprises clear abrasive particles.

77. The system of claim 75, wherein the clear gel comprises abrasive particles that are not clear.

78. The system of claim 70, wherein the photosensitive agent comprises an anti-bacterial agent for removing bacteria in the presence of the polychromatic electromagnetic radiation.

79. The system of claim 78, wherein the anti-bacterial agent has an affinity for bacteria, whereby, during use of the system, the anti-bacterial agent is concentrated about areas of bacteria on the target surface relative to other areas on the target surface.

80. The system of claim 70, wherein the photosensitive agent comprises an anti-plaque agent for removing plaque in the presence of the polychromatic electromagnetic radiation.

81. The system of claim 80, wherein the anti-plaque agent has an affinity for plaque, whereby, during use of the system, the anti-plaque agent is concentrated about areas of plaque on the target surface relative to other areas on the target surface.

82. The system of claim 81, further comprising a disclosing agent having an affinity for bacteria and/or plaque, wherein said disclosing agent changes appearance when irradiated by the polychromatic electromagnetic radiation, whereby, during use of the system, the disclosing agent is concentrated about areas of bacteria and/or plaque on the target surface relative to other areas on the target surface, whereby the irradiated, disclosing agent announces locations of bacteria and/or plaque on the target surface.

83. The system of claim 70, wherein the photosensitive agent comprises a foaming agent for generating foam in the presence of the polychromatic electromagnetic radiation, whereby foam generated during use of the system operates as a carrier that delivers dentifrice to areas not reachable by the toothbrush cleaning surface.

84. The system of claim 70, wherein:
- a. the dentifrice is disposed in a container; and
  - b. the toothbrush and the container are disposed within a package.

85. The system of claim 70, wherein the polychromatic electromagnetic radiation is at least substantially free of ultraviolet radiation.

86. The system of claim 70, wherein the cleaning surface comprises bristles.

87. The system of claim 70, wherein the predetermined range has a lower limit of approximately 350 nanometers and an upper limit of approximately 700 nanometers.

88. The system of claim 70, wherein:

a. the photosensitive agent has a relatively high reaction rate when exposed to electromagnetic radiation in a highly reactive portion of the predetermined range compared to an average reaction rate when the photosensitive agent is exposed to electromagnetic radiation over the predetermined range; and

b. the polychromatic electromagnetic radiation is bound to wavelengths that are substantially within the highly reactive portion of the predetermined range.

89. The system of claim 88, wherein the predetermined range has a lower limit of approximately 350 nanometers and an upper limit of approximately 700 nanometers.

90. A method of providing a tuned whitening and cleaning system for teeth, the system comprising a dentifrice and an electromagnetic radiation emitting toothbrush, the method comprising the steps of:

a. formulating the dentifrice, wherein the dentifrice comprises photosensitive agents;

b. determining wide-range reactive electromagnetic radiation wavelengths that cause the photosensitive agents to react; and

c. designing the electromagnetic radiation emitting toothbrush such that the electromagnetic radiation emitting toothbrush emits at least a portion of the wide-range reactive electromagnetic radiation wavelengths.

91. The method of claim 90, wherein the portion of the wide-range reactive electromagnetic radiation wavelengths consist essentially of non-ultraviolet radiation.

92. The method of claim 91, wherein the portion of the wide-range reactive electromagnetic radiation consists essentially of wavelengths within a range of 300 to 750 nanometers.

93. The method of claim 91, wherein the portion of the wide-range reactive electromagnetic radiation is polychromatic.

94. The method of claim 91, wherein the portion of the wide-range reactive electromagnetic radiation is monochromatic.

95. The method of claim 91, wherein:

a. the step of determining the wide-range reactive electromagnetic radiation wavelengths further comprises a step of determining narrow-range reactive electromagnetic radiation wavelengths, wherein the photosensitive agent has a relatively high reaction rate when exposed to the narrow-range reactive electromagnetic radiation wavelengths compared to an average reaction rate when the photosensitive agent is exposed to the wide-range reactive electromagnetic radiation wavelengths; and

b. the step of designing the electromagnetic radiation emitting toothbrush further comprises a step of designing the electromagnetic radiation emitting toothbrush so that the electromagnetic radiation emitting toothbrush

emits at least a portion of the narrow-range reactive electromagnetic radiation wavelengths.

96. The method of claim 95, wherein the portion of the narrow-range reactive electromagnetic radiation wavelengths consists essentially of wavelengths within a range of 300 to 750 nanometers.

97. The method of claim 95, wherein the portion of the narrow-range reactive electromagnetic radiation wavelengths is polychromatic.

98. The method of claim 95, wherein the portion of the narrow-range reactive electromagnetic radiation wavelengths is monochromatic.

99. A method of providing a tuned whitening and cleaning system for teeth, the system comprising a dentifrice and an electromagnetic radiation emitting toothbrush, the method comprising the steps of:

- a. determining the electromagnetic radiation wavelengths the electromagnetic radiation emitting toothbrush radiates and
- b. using photosensitive agents to formulate the dentifrice such that the dentifrice reacts when irradiated by the electromagnetic radiation emitting toothbrush.

100. The method of claim 99, wherein the electromagnetic radiation emitting toothbrush emits electromagnetic radiation wavelengths that consist essentially of non-ultraviolet radiation.

101. The method of claim 100, wherein the electromagnetic radiation emitting toothbrush emits essentially only electromagnetic radiation wavelengths between 300 and 750 nanometers.

102. The method of claim 100, wherein the electromagnetic radiation emitting toothbrush emits monochromatic electromagnetic radiation.

103. The method of claim 100, wherein the electromagnetic radiation emitting toothbrush emits polychromatic electromagnetic radiation.